

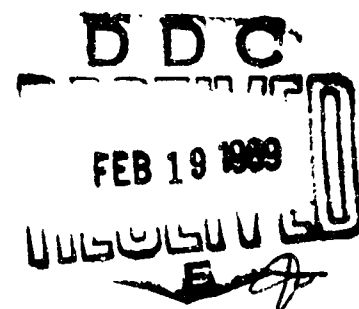
Technical Research Note 202

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FACTOR ANALYSIS OF A SITUATIONAL LEADERSHIP MEASURE--THE SPEEDED PRACTICAL JUDGMENT TEST

William H. Helme

BEHAVIORAL EVALUATION RESEARCH DIVISION



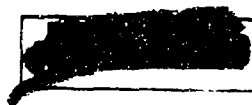
U. S. Army
Behavioral Science Research Laboratory

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U. S. ARMY BEHAVIORAL SCIENCE RESEARCH LABORATORY

Office, Chief of Research and Development
Department of the Army

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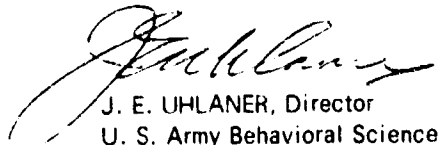
FOREWORD

The mission of the OFFICER PREDICTION Work Unit is to develop improved means of assigning officers who have aptitudes and other characteristics to meet the differing demands of different officer activities.

The research program consists of the development of psychological tests and techniques and the evaluation of the measures as differential predictors of performance in combat, technical, and administrative duties. In 1958 and again in 1962, experimental tests for the Differential Officer Battery were administered to Regular Army and Reserve officers entering on active duty, numbering in all 3,000. The experimental predictors are being evaluated as predictors of success as measured by several methods. Ratings by superiors and peers were accomplished after about one year of active duty. In 1964 and 1965, an integrated series of situational tests in which the officer is confronted with problems typical of service in each of the three areas was administered to 900 officers previously tested with the experimental battery. The exercise was staged at the Officer Evaluation Center established for the purpose at Fort McClellan, Alabama. In 1967 and 1968, evaluations of performance in combat (Vietnam) and in combat-ready situations (Europe, Korea, CONUS) were obtained.

Analyses now being completed are concerned chiefly with means of scoring the predictor instruments. The present Technical Research Note details the analysis of officer responses and formulation of scoring scales for the Speeded Practical Judgment Test.

The entire research task is responsive to special requirements of the Deputy Chief of Staff for Personnel as well as to requirements of RDT&E Project 2J062106A722, "Selection and Behavioral Evaluation: Personnel Measurement," FY 1969 Work Program.



J. E. UHLANER, Director
U. S. Army Behavioral Science
Research Laboratory

FACTOR ANALYSIS OF A SITUATIONAL LEADERSHIP MEASURE-- THE SPEEDED PRACTICAL JUDGMENT TEST

BRIEF

Requirement:

Development of scoring formulas for many of the experimental predictors of the Differential Officer Battery requires detailed and complex analysis of officer responses. These analyses, while time-consuming, are an essential step toward developing psychological measures that are usefully discriminative for assignment to combat, technical and administrative duties. The method used in the case of the Speeded Practical Judgment Test involved a rather unusual technique for dealing with noncognitive data.

Procedure:

The test consists of eleven situations presented as brief motion pictures. In each, a conflict in command performance is developed to the point at which the officer must make a decision. Four solutions are then offered. The officer indicates on a four-point scale the extent of his agreement with each solution before the next is presented. Officer responses to the 44 alternative solutions were analyzed on the basis of interrelationships (factor-analyzed) to determine the extent to which aspects of practical judgment could be statistically isolated for scoring purposes.

Findings:

Each officer will be scored on

- I. Taut Ship
- II. Indecision
- III. Reluctant Leadership
- IV. Buckpassing
- V. Combat Discipline
- VI. Mediation
- VII. Considerate Leniency
- VIII. Command Responsibility

Utilization of Findings.

The effectiveness of the eight scores as predictors of officer performance will be evaluated on the basis of 1) first year ratings, 2) performance in a simulated combat situation staged at the specially established Officer Evaluation Center, and 3) 1967 - 68 ratings obtained in the field either in combat in Vietnam or in combat-ready situations (Europe, Korea, CONUS).

The completed battery can be expected to permit greater discrimination in the assignment of officers, particularly newly commissioned ROTC graduates serving a two-year obligated term of service.

FACTOR ANALYSIS OF A SITUATIONAL LEADERSHIP MEASURE--
THE SPEEDED PRACTICAL JUDGMENT TEST

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FACTOR ANALYSIS OF A SITUATIONAL LEADERSHIP MEASURE-- THE SPEEDED PRACTICAL JUDGMENT TEST

BACKGROUND

The Speeded Practical Judgment Test is one of the measures in a series of experimental psychological instruments designed to measure characteristics important in officer leadership--the "generalist" concept. The battery is also designed to measure qualities relevant to performance in each of three broad areas of officer activity--combat, technical, and administrative.

In a comprehensive longitudinal study, the earliest version of the battery, the Differential Officer Leadership Battery (DOL), was administered to about 6,500 officers at entry on active duty in 1958 and 1959. In 1962 and 1963, a revised and shortened version, the Differential Officer Battery (DOB), was given to 4,000 entering officers. Officers in both samples were rated by superiors and colleagues on job performance and potential in their first term of service. In addition, 900 of the 4,000-man sample were evaluated objectively and in detail on their performance of 15 tasks in a simulated combat situation at the Officer Evaluation Center (OEC) in 1963 and 1964. Finally, all members of the two large samples who were still on active duty were rated on performance in a combat theater (Vietnam) in 1967 or in combat-ready situations in Europe, Korea, or CONUS late in 1967 or early in 1968.

The purpose of the longitudinal study was to validate the experimental predictors for the various criteria and to determine the equivalence of the criteria, particularly the OEC situational exercise and performance in Vietnam combat.

OBJECTIVE OF THE PRESENT STUDY

The first step was internal analysis of officer responses to provide scoring scales for the various instruments which would be internally homogenous and relatively independent from each other. The present study was concerned with internal analysis of factors in the Speeded Practical Judgment Test to yield such scoring scales for validation.

METHOD OF ATTACK

Nature of the Measure

The Speeded Practical Judgment Test consists of 11 situations presented as brief motion pictures. Each one depicts a conflict in command performance confronting a company-grade officer. The situation is developed to the point at which the officer must announce a decision

resolving the conflict. After a pause, a solution is presented and the subject indicates his degree of agreement on a scale from 1 to 4. Three alternative solutions, for a total of four, are presented singly for each given situation. Thus, the 44 solutions are in effect test items. The situations vary from handling recruits and conflicts calling for administrative decisions to matters concerning command and combat. The situations, briefly characterized, together with the offered solutions, are presented in the Appendix.

Sample

In order to represent all branches adequately, the sample was composed of 100 cases selected randomly from each of nine Branch Basic School entering classes--Infantry, Armor, Artillery, Engineer, Signal, Ordnance, Quartermaster, Adjutant General, and Finance--for a total of 900. This sample was drawn from the 4,000 cases in the later input group.

Method of Analysis

The 44 items were intercorrelated (Pearson product moment correlation coefficient) and the resulting matrix was analyzed by the Hotelling method, employing highest off-diagonals for the successive communality estimates. Twenty factors were extracted, but the 13th and several later latent roots proved to be negative. Since the purpose was to provide scales which would yield fairly reliable scores, sets of from five to ten factors were compared. An eight-factor solution was chosen. From the item loadings on the eight-factor set, items were selected and weighted to compose the final scales for validation. Clarity of interpretation and consistency of mean preference value were considered in choosing the eight-factor solution, as well as availability of enough items with loadings of .25 or higher for each scale.

RESULTS

Choice of Factor Solution

As noted above, solutions involving more than 12 factors involved use of factors with negative latent roots. Moreover, factors beyond 11 were somewhat suspect, in that there were only 11 experimentally independent situations. The four alternative decisions to a given situation were not experimentally independent.

Solutions yielding 10 or more factors were found, by two independent judges, to be too fragmented and to include several short and questionably reliable scales. On the other hand, solutions yielding 5 factors or fewer left out too much of the common variance among items (Table 1). The final decision was made between the eight- and nine-factor solutions. These matched well, except that Factor VII in the eight-factor solution was reduced from 4 to 2 items in the nine-factor solution. The added factor in

the latter solution appeared to be related to expression of anger rather than to a particular way of resolving conflicts. Moreover, the factors of the eight-factor solution showed a smaller within-factor variance of mean item preference value than did the counterpart factors of the nine-factor solution. Although not conclusive, this finding indicated greater within-factor homogeneity. Finally, the factors of the eight-factor solution tended to be more nearly equal in magnitude. Percent of variance in each of the eight factors is shown in Table 2. With the first eight factors accounting for less than 24% of the total variance, however, there is some danger that valid variance within single items may be lost. Although every item is placed in one and only one scale, an item with a loading of only .20 may well have any unique validity cancelled out when combined in a scale with other items. The distribution of communalities for the eight-factor set also indicates the problem: only 4 items have $h^2 > .42$, the median h^2 is .21, and there are 11 items with $h^2 < .15$.

Table 1

PERCENT OF VARIANCE ACCOUNTED FOR BY SETS OF FACTORS
IN THE SPEEDED PRACTICAL JUDGMENT TEST

No. of Factors	Percent of Variance	Range of Single-Factor Variance	No. Factors Variance < 2
3	14.70	4.50 - 5.34	0
4	17.84	3.91 - 5.27	0
5	19.84	3.52 - 4.78	0
6	22.07	3.47 - 4.72	0
7	24.90	3.24 - 4.41	0
8	23.77	3.25 - 4.4	0
9	24.1	3.22 - 4.47	1
10	25.61	3.47 - 4.36	2
11	26.43	3.22 - 4.35	4
12	27.13	3.47 - 4.42	5
13	27.27	3.3 - 4.42	6
14	28.47	3.27 - 4.41	7
15	28.53	3.11 - 4.47	8

Table 2

VARIANCE ACCOUNTED FOR BY EIGHT FACTORS
OF THE SPEEDED PRACTICAL JUDGMENT TEST

Factors	Percent of Variance
I. Taut Ship	4.49
II. Indecision	3.30
III. Reluctant Leadership	2.35
IV. Buckpassing	2.48
V. Combat Discipline	2.65
VI. Mediation	3.29
VII. Considerate Leniency	2.39
VIII. Command Responsibility	2.78
Total	23.73

The scales obtained therefore represent only the first organization of items into sets for validation. If these scales prove non-valid, and do not correlate appreciably with scales of logically similar content from other predictors--that is, if they have low construct validity, then it will be necessary to validate single items for the various criteria.

The factor scales are briefly interpreted below in terms of general attitudes and modes of leadership. The Appendix gives a fuller and more specific description of problem and solution content.

Factor I. Taut Ship

<u>Item No.</u>	<u>Problem</u>	<u>Alternative Solution</u>	<u>Loading</u>
25	Insubordination to NCO	Supports NCO; reprimands EM	.71
26	Insubordination to NCO	Supports NCO; expresses regret	.70
32	NCO countermands O	Supports NCO; reprimands NCO strongly	.49
29	NCO countermands O	Supports NCO; reproves NCO mildly	.41
28	Insubordination to NCO	Supports EM; tells EM to apologize	-.44

Double weight in scoring was accorded to items 25 and 26, negative unit weight to item 28.

Factor II. Indecision

<u>Item No.</u>	<u>Problem</u>	<u>Alternative Solution</u>	<u>Loading</u>
24	Compassionate leave (Poor worker)	Postpones decision	.40
37	NCO advises surrender	Defers to NCO, surrenders	.34
23	Compassionate leave	Complains, gives leave	.33
21	Compassionate leave	Gives leave, privately	.32
36	NCO overdrives men	Asks superior's advice	.29
31	NCO countermands O	Overrules, gives pass	.29
34	NCO overdrives men	Credits but reprimands	.29
2	Competing requirements	Blames absent NCO	.28
17	Experienced NCO vs LT	Supports NCO; reprimands O	.27
32	NCO countermands O	Supports but reprimands NCO	.19
1	Competing requirements	Commiserates, no blame	.17

Scoring was unit-weighted for all items.

Factor III. Reluctant Leadership

<u>Item No.</u>	<u>Problem</u>	<u>Alternative Solution</u>	<u>Loading</u>
35	NCO overdrives men	Backs NCO; rejects EM	.39
18	Experienced NCO vs LT	Back LT; reprimands NCO	.34
30	NCO countermands O	Reprimands both	.31
16	Shorthanded for reqt	Requests coop. effort	.25
22	Compassionate leave	Grants leave; complains	.25
20	Experienced NCO vs LT	Reprimands both; leaves decision to them	.23
27	Insubordination to NCO	Allows EM pass; reprimands	.23

Factor IV. Buckpassing

<u>Item No.</u>	<u>Problem</u>	<u>Alternative Solution</u>	<u>Loading</u>
10	NCO contests O promoting EM	Gives in to NCO	.64
11	NCO contests O promoting EM	Gives in, explains to EM	.62
12	NCO contests O promoting EM	Promotes but warns EM	-.34

Items 10 and 11 were double-weighted, item 12 negatively unit-weighted.

Factor V. Combat Discipline

<u>Item No.</u>	<u>Problem</u>	<u>Alternative Solution</u>	<u>Loading</u>
41	NCO disobeys, takes mission himself	Reprimands and prefers charges	.56
42	NCO disobeys, takes mission himself	Reprimands and warns NCO	.48
43	NCO disobeys, takes mission himself	Credits NCO, reprimands	-.43
44	NCO disobeys, takes mission himself	Warns NCO, forgives	-.46

Unit weight were used for all, negative for items 43 and 44.

Factor VI. Mediation

<u>Item No.</u>	<u>Problem</u>	<u>Alternative Solution</u>	<u>Loading</u>
19	Experienced NCO vs LT	Supports NCO; mollifies O	.41
33	NCO overdrives men	Praises and warns NCO; explains to EM	.39
9	NCO contests O promoting EM	Postpones; probationary promotion	.35
3	Competing requirements	Takes blame on self	.31
13	Shorthanded for reqt	Takes blame; asks cooperation	.30
15	Shorthanded for reqt	Orders compliance	.23

All items were unit-weighted.

Factor VII. Considerate Leniency

<u>Item No.</u>	<u>Problem</u>	<u>Alternative Solution</u>	<u>Loading</u>
7	Parents' visit vs work detail	Overrules NCO privately	.50
6	Parents' visit vs work detail	Overrules NCO	.37
5	Parents' visit vs work detail	Regrets; backs NCO	-.32
8	Parents' visit vs work detail	Orders man to obey	-.42

All items were unit-weighted, 5 and 8 negatively.

Factor VIII. Command Responsibility

<u>Item No.</u>	<u>Problem</u>	<u>Alternative Solution</u>	<u>Loading</u>
40	NCO advises surrender	Replaces NCO; orders break out	.47
39	NCO advises surrender	Orders NCO to lead break out	.39
14	Shorthanded for reqt	Takes blame; orders compliance	.38
4	Competing requirements	Asserts rank; blames present NCO	.32

All items were unit weighted.

SUMMARY

The Speeded Practical Judgment Test, involving evaluation of each of four alternative solutions to each of 11 leadership conflict situations, was factored on the basis of item intercorrelations. After comparison of several factor solutions, the eight-factor set was selected and scoring scales were adopted. Factors were identified as Taut Ship, Indecision, Reluctant Leadership, Buckpassing, Combat Discipline, Mediation, Considerate Leniency, and Command Responsibility.

These scales are to be validated for first-tour performance ratings, for performance in the simulated combat situation at the Officer Evaluation Center, and for performance in real combat and combat-ready situations in 1967-68. The scales are also to be correlated with other predictor measures. If these scales show neither empirical nor construct validity, item validation will be tried.

APPENDIX

PRECIS OF SITUATIONS AND SOLUTIONS

Problem A: Conflict between completing requirements results in one sergeant's being gigged.

1. Commiserates, no blame
2. Blames other sergeant
3. Takes blame on self
4. Asserts rank, blames present sergeant

Problem B: Conflict between parents' arrival and assignment of recruit son to work detail.

5. Regrets, but keeps man on detail
6. Overrules sergeant in man's presence
7. Overrules sergeant privately--instructs him
8. Directs man to obey order

Problem C: Conflict with sergeant over promotion of subordinate.

9. Postpones action--probationary promotion
10. Gives in to sergeant
11. Gives in, explains to man not promoted
12. Makes promotion, jacks up promotee

Problem D: Conflict between command requirement and sergeant's complaint of short-handedness

13. Takes blame--requests cooperative effort
14. Takes some blame, but orders compliance
15. Orders compliance
16. Requests cooperative effort

Problem E: Conflict between experienced sergeant and junior officer (LT) over location of facility

17. Supports sergeant, mildly reprimands lieutenant
18. Supports lieutenant, reprimands sergeant
19. Mollifies lieutenant, supports sergeant's decision
20. Reprimands both, refers decision to them

Problem F: Conflict between poor performance of corporal and his request for compassionate leave

21. Reprimands, refers to Red Cross for report
22. Gives leave, complains, keeps in confidence
23. Complains resentfully, gives leave, will check story
24. Postpones decision, puts question up to EM

Problem G: Conflict between insubordination of corporal to sergeant and good past record of corporal

- 25. Cancels pass, reprimands corporal
- 26. Regrets, but cancels pass
- 27. Supports pass, but reprimands corporal
- 28. Complains, grants pass, suggests apology by corporal

Problem H: Same as G, but in relation to sergeant

- 29. Cancels pass, but reprimands sergeant
- 30. Reprimands both corporal and sergeant
- 31. Asserts rank, supports pass, reprimands sergeant
- 32. Cancels pass, strongly reprimands sergeant

Problem I: Conflict between strong effective sergeant and injury to overdriven man under him

- 33. Praises effectiveness, but cautions sergeant; reports to complainant
- 34. Credits sergeant, but reprimands him
- 35. Backs sergeant, reprimands complainant
- 36. Reports to superior, asks for advice

Problem J: Conflict between sergeant's advice to surrender and danger of tight spot in combat

- 37. Defers to sergeant, surrenders
- 38. Decides to make a break for it, but "sauve qui peut"
- 39. Orders sergeant to lead the break
- 40. Takes over, replaces sergeant, orders the break

Problem K: Conflict between sergeant's taking dangerous mission instead of sending man as ordered

- 41. Reprimands sergeant and prefers charges for disobedience
- 42. Reprimands strongly and warns--no charges
- 43. Mentions mission accomplished, but reprimands
- 44. Warns, but forgives sergeant

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